



## The Prevalence of Necariodental Diseases of the Tooth in the Valley (Foothills)

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**Abstract:** The results of the study indicate the vulnerability of the dental system of children to the effects of adverse environmental factors. The prevalence of non-carious dental lesions is directly dependent on the concentration of fluoride compounds in the external environment: they are more common in schoolchildren living in the most unfavorable environmental conditions.

**Keywords:** dental system, the impact of adverse environmental factors, tooth, medicine, necariodental diseases.

Necariodental lesions (or destruction of hard tissues of teeth of non-carious origin) is a summative term that unites a large group of diseases (and damages) of hard tissues of teeth (enamel, dentin, cement) having various clinical manifestations, the occurrence and development of which, however, is not directly related to the microbial factor, unlike carious lesions.

All non-carious lesions of the teeth are usually divided according to their formation period into two large groups:

I. Lesions of the teeth that occurred during the follicular development of their tissues (before teething):

- 1.1. Hypoplasia of dental tissues.
- 1.2. Hyperplasia of dental tissues.
- 1.3. Dental fluorosis.
- 1.4. Hereditary disorders of dental development.
- 1.5. Medical disorders of dental tissue development.

II. Dental lesions that occurred after their eruption:

- 1.1. Pathological (increased) tooth abrasion.
- 1.2. Wedge-shaped defect of teeth.
- 1.3. Erosion of teeth.
- 1.4. Medical and toxic damage to dental tissues.
- 1.5. Dental trauma.

### 1.6. Hyperesthesia (hypersensitivity) of teeth.

Dysplasia (Latin dysplasia— is a violation of the maturation (differentiation) of hard tooth tissues caused by various pathogenic factors, including genetic ones. It is observed in such hereditary diseases as Stainton-Capdepon's disease, imperfect amelogenesis and imperfect dentinogenesis, and also occurs under the influence of other endogenous factors in rickets, dental fluorosis, is one of the factors in the formation of teeth of Getchinson, Fournier, Pfluger, Turner.

Hypoplasia - Latin hypoplasia) is the underdevelopment of the hard tissues of the tooth, the malformation of which is manifested by quantitative and qualitative changes. With hypoplasia, there is a violation of the formation of the protein matrix of the tooth and mineralization processes. The causes of this process lie both in the field of gene breakdown and are inherited, and in the field of external factors, and, consequently, are acquired (intrauterine infections and toxic conditions, metabolic disorders, hormonal disorders, the effect of drugs in the prenatal and postnatal periods).

Hyperplasia (Latin hyperplasia) is the excessive formation of hard tooth tissues of a non-tumor nature. It can be hereditary or acquired. An example of dentin and enamel hyperplasia is enamel drops or "enamel pearls". These are round-shaped formations, ranging in size from 1 to 4 mm in diameter, and consist of either enamel or dentin covered with enamel. Sometimes there is a cavity filled with pulp inside such a drop. The tissue structure of such drops is not changed. They can be located outside, in the area of the neck of the tooth or bifurcation, or inside - in the thickness of the tissues or in the cavity of the tooth. They occur in about 1.5-2.0% of the population.

Hereditary disorders of dental development include: Stainton—Capdepon disease (Stainton—Capdepon syndrome, Capdepon dysplasia, coreless teeth, hereditary darkening of teeth, etc.), imperfect amelogenesis (brown enamel dystrophy), imperfect dentinogenesis (imperfect bone formation, intrauterine rickets, periosteal dystrophy, hereditary mesenchymal hypoplasia, "glass men" disease), marble disease, hypophosphatesia. These diseases are based on hereditary disorders of amelogenesis and dentinogenesis, often in combination with osteogenesis imperfecta, associated with defects in collagen genes and collagen-associated proteins. Various clinical manifestations are determined by a set of collagen defects of different types (1st, 2nd, 5th type) associated with gene disorders in different chromosomes (22nd, 4th, 4q chromosome), they are genetically identified and isolated into separate collagenopathies and nosological forms.

In women with non-carious lesions of the teeth, a reduced content of ionized calcium and magnesium in the blood, an increase in biochemical markers of bone resorption, a decrease in bone mineral density (according to densitometry) were revealed. Low concentration of estrogens in the blood is the leading pathogenetic cause of the development of erosions, wedge-shaped defects and pathological tooth abrasion in women. At the same time, women with this pathology are at risk of developing osteoporosis. It is because of this that non-carious lesions of the teeth themselves (erosion, wedge-shaped defects, pathological erasability) are considered early markers, "alarm signals" of the formation of osteopenia and osteoporosis.

Tooth erosion is defects of rounded, oval, but more often irregular shape in the hard tissues of the tooth, usually located on the frontal or buccal surface symmetrically on the teeth of the same name. The incisors of the upper jaw are mainly affected, as well as the canines and premolars of both jaws. The bottom of erosion is usually dense, smooth and shiny. At the beginning of development, erosion most often takes the form of a rounded or oval defect on the vestibular surface of the tooth, but later there is a gradual deepening and expansion of the erosion boundaries, which can ultimately lead to the loss of almost all the enamel of the vestibular surface of the tooth, as well as part of the dentin.

Wedge-shaped defects are localized in the cervical region of the tooth, initially they have the shape of a slit, and then a V-shaped or wedge shape (hence their name). All teeth can be affected, but more

often canines, premolars and molars. Single defects occur rarely, as a rule, they appear symmetrically on the teeth of the same name. There are four clinical stages of the disease, passing from the initial to the deep, which are characterized by different defect depths from 0.1 mm to 5 mm or more.

Pathological (increased) erasability (erasure) of teeth - in contrast to the physiological erasability of teeth, it is characterized by an earlier and significantly pronounced loss of hard tissues, which is more often generalized and is noted on all teeth. According to external clinical manifestations, horizontal, vertical and mixed types of tooth erasability are traditionally distinguished. In this case, tissue loss occurs either in the horizontal plane, then the cutting edges of the teeth, bumps and chewing surfaces are erased, or in the vertical plane, and then tissue loss occurs on the vestibular surface of the teeth.

Hyperesthesia (hypersensitivity) of teeth (synonyms: sensitive dentin, English dentin sensitive). Hypersensitivity of the hard tissues of the teeth (hyperesthesia) is a short-term pain in response to the action of various stimuli (chemical, temperature, tactile). The intensity of pain reactions can vary from mild sensitivity (discomfort) to severe pain that makes it difficult to eat and brush teeth.

A multidisciplinary program with an algorithm for the examination and treatment of women with various forms of non-carious dental lesions is proposed. The program consists of three stages.

The first stage is a dental examination of the patient with the diagnosis and determination of the stage of the disease. To assess the severity of the disease, indices of the prevalence and intensity of non-carious lesions of the teeth (IRnp, IInp), as well as an indicator of the clinical severity of non-carious lesions of the teeth (PCVnp) are used.

The second stage includes examination of the patient by specialized specialists (gynecologist, endocrinologist, therapist, etc.). To verify hormonal and metabolic disorders, an algorithm of clinical and laboratory examination is proposed:

- 1) determination of the concentration of hormones in the blood: estradiol, cortisol, prolactin;
- 2) ultrasound examination of the ovaries with an assessment of the ovarian reserve;
- 3) determination of biochemical markers of bone resorption (Cross Laps in urine, acid phosphatase of blood);
- 4) control of mineral homeostasis by the level of ionized calcium, magnesium and inorganic blood phosphates;
- 5) assessment of bone mineral density (BMD) according to densitometry of the lumbar spine and proximal thigh. Such a complete examination is necessary for the early detection of osteopenia and osteoporosis in women.

The third stage consists in carrying out therapeutic measures aimed at increasing the mineralization of the hard tissues of the teeth and performing restoration work.

At the same time, it should be understood that the concept of "non-carious lesions of the teeth" and the above classification are used only in domestic literature. In foreign science and dental practice, each form of manifestation of the disease is defined as an independent nosological unit.

There is no single view among scientists and physicians on the occurrence and development of most non-carious dental lesions (both groups I and II).

The prevalence of non-carious lesions of the teeth of the first group in the population, as a rule, is small and, according to various authors, ranges from 5 to 14%. They are formed in children in the prenatal and infancy period at the stage of laying and development of the rudiments of teeth (dental follicles), that is, before teething into the oral cavity. These lesions are the result of impaired differentiation and formation of hard tissues of the teeth, or their mineralization.

All these stages are often combined, for example, due to the impact of adverse factors. Such factors are some genetic disorders, various physical and chemical agents (exceeding the regulatory limits both in strength and duration of action), which sometimes have a direct or indirect effect on the developing child's body and, in particular, the dental rudiment formed during this period of time. Pathogenic drugs (primarily antibiotics and hormones, as well as heavy metals) that enter the mother's body during pregnancy or the child in the first years of life can become pathogenic. An example of this is: violation of enamel mineralization caused by hypervitaminosis D, or its deficiency (rickets); dental fluorosis (where fluoride acts as a toxic factor); as well as the so-called "tetracycline teeth" (violation of enamel development associated with tetracycline intake).

The diagnosis begins with an assessment of the dental status of the patient, for this purpose a visual and instrumental examination of the oral cavity is carried out, anamnesis is collected. For proper diagnosis, it is necessary to know a set of clear criteria that allow differentiating one nosological form of non-carious lesions from another, as well as from damage to the hard tissues of teeth of carious origin (caries in the stage of spots). When detecting erosion, wedge-shaped defects and pathological tooth erasability, an important point is to determine the stage of the disease (exacerbation or remission), since the treatment of the disease in its different periods has serious differences.

In determining the cause of the disease, examination of the patient and consultation with other specialists (gynecologist, endocrinologist, nephrologist, etc.) is of paramount importance. This is especially important when detecting erosions, wedge-shaped defects and increased tooth erasability in women of reproductive age.

The general treatment of all non-carious lesions of the teeth is aimed at increasing the body's resistance, relieving hyperesthesia and strengthening the hard tissues of the teeth. For this purpose, prescribe preparations of a complex of vitamins (C, A, E, B<sub>1</sub>, B<sub>6</sub>), as well as dosage forms of micro- and macroelements (Ca, Mg, Zn, etc.) in combination with vitamin D<sub>3</sub>.

Adjust the diet by filling it with products with a high content of essential vitamins and trace elements. It is recommended to eat sea products and especially sea cabbage (kelp algae). The diet should also be balanced in terms of protein, fat and carbohydrates to optimize calcium metabolism. Women with erosions, wedge-shaped defects and increased erasability of teeth after examination by specialists (gynecologist, endocrinologist), if necessary, are prescribed therapy to normalize the hormonal background and treat concomitant pathology. Various methods of ovarian function stimulation are used, preparations containing phytoestrogens are used, hormone replacement therapy (HRT) is prescribed according to indications. Foods with a high content of plant estrogens are recommended.

The problem of the impact of technogenic pollution of the environment by industrial enterprises on the health of the population and the justification of state health measures in the conditions of constant socio-economic changes taking place all over the world are today priority tasks of state policy. One of the most promising branches of the valley is production due to the wide use of its products in the national economy. At the same time, the industry is characterized by a complex of unfavorable chemical factors that negatively affect the health of the local population. At the same time, it is the state of children's health that is a relatively sensitive indicator when assessing the harmful effects of environmental pollution on the body. Hygienic assessment of the formation of environmental pollution, its impact on the prevalence of non-carious dental lesions among children living near the valley where there are chemical plants.

In the course of the study, an assessment of the sanitary and hygienic characteristics of settlements located in the area of the influence of man-made emissions of aluminum production was carried out. Taking into account that the main harmful factor of the plant's emissions are fluorides, the degree of

pollution of environmental objects with fluoride compounds was determined. In total, more than 200 samples were taken for hydrogen fluoride and hydrofluoric acid salts in different sites.

In order to establish the prevalence of non-carious dental lesions, the dental status of schoolchildren in the main and control districts was studied with filling out a card to assess the dental status.

It is established that, despite the decline in production volumes in recent years, there is no improvement in the ecological situation in the valley. On the contrary, the concentration of fluoride compounds in the environmental objects of settlements located around the plant has increased.

The plant's emissions also pollute open water sources, soil and crop products. It should be noted that the fluoride compounds contained in them have a high ability to accumulate in media, and in a concentration depending on the distance and direction from the plant. Environmental objects are most polluted in settlements located in the western and northeast directions; as they approach the plant, their concentration increases.

So, the content of fluorides in water was 2.1-3.0 times higher for drinking water. It should be noted that the population living in the western and north-eastern directions is not provided with tap water and uses irrigation ditch water for drinking and household needs that does not meet sanitary and hygienic requirements. At the same time, the content of fluorides in food products cultivated on these soils directly depends on their content in the soil. High concentrations of fluoride compounds were observed in the most commonly consumed crop products (potatoes, onions, cabbage). At the same time, certain types of cultivated plants (cabbage, dill) are able to significantly accumulate fluorides (up to 2.6-3.77 mg/ kg), which undoubtedly serves as an additional factor in the development of chronic fluoride intoxication.

Thus, toxic fluorine compounds, constantly accumulating in environmental objects, enter the body of children in significant quantities through the respiratory tract, with food and drinking water. In such an environment, there is a high level of risk of adverse effects of technogenic factors of aluminum production on the health and dental status of the child population.

The results of the study of non-carious lesions of the teeth showed that the prevalence of enamel hypoplasia and dental fluorosis among the children's population in the main and control areas is not the same and depends on the level of pollution of environmental objects by emissions of aluminum production.

Thus, among children of the main district, systemic hypoplasia of tooth enamel occurs more often than in the control one. Analysis of the data characterizing age-related changes in this indicator in middle school age revealed a significant difference: the prevalence of systemic hypoplasia was higher among children of the main district ( $3.96 \pm 0.75\%$ ) than among children of the control district ( $2.26 \pm 0.31\%$ ). During the period of high school age, the prevalence of systemic hypoplasia in the compared areas was  $4.30 \pm 0.51\%$  and  $2.99 \pm 0.53\%$ , respectively.

When studying the prevalence of dental fluorosis among children of the compared areas, significant differences were also revealed. The frequency of this pathology decreased as the students' place of residence was removed from the aluminum plant and the degree of environmental pollution with fluoride compounds decreased. Thus, the prevalence of dental fluorosis in school-age children born and permanently residing in the main area was  $27.18 \pm 1.53\%$ , and in the control  $-0.56 \pm 0.31$ . In the control area, a very weak form of dental fluorosis was detected, obviously associated with a low content of fluoride in the environment.



**Conclusions:**

- The population living in the area of the plant's location is affected by different concentrations of fluoride compounds, the intensity of which depends on the wind rose.
- The highest concentrations of fluoride compounds, significantly exceeding, were observed in the air of settlements located in the western and north-eastern directions from the plant. High concentrations of fluorides have also been found in water and crop products.
- The ingestion of elevated concentrations of fluoride compounds with air, water and food can cause the development of various diseases, especially among the population living in the western and northeast directions from the plant.

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